

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
2011 South Clark Place Room  
CP2/5C24  
Arlington, VA 22202  
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in its capacity as elected Office

Date of mailing (day/month/year) 06 April 2001 (06.04.01)	
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International filing date (day/month/year) 26 May 2000 (26.05.00)	Priority date (day/month/year) 28 May 1999 (28.05.99)
Applicant DALL'ARMI, Vivian et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:29 December 2000 (29.12.00)☐ in a notice effecting later election filed with the International Bureau on:2. The election ☐ was☒ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer  Claudio Borton
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09/744 230

PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

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NOTIFICATION THAT DEMAND OR  
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BEEN SUBMITTED OR MADE

(PCT Rule 60.1(c) or 60.2(c) and  
Administrative Instructions, Section 418)

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark Office,  
PCT  
2011 South Clark Place Room CP2/5C24  
Arlington, VA 22202  
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Applicant

TROJAN TECHNOLOGIES INC.

1. ☒ The International Bureau hereby notifies the elected Office that the International Preliminary Examining Authority has declared that the demand relating to the international application has been considered as if it had not been submitted.
2. ☐ The International Bureau hereby notifies the elected Office that it has declared that the notice containing the later election of the (following) State(s) for which the Office acts as elected Office has been considered as if it had not been submitted:

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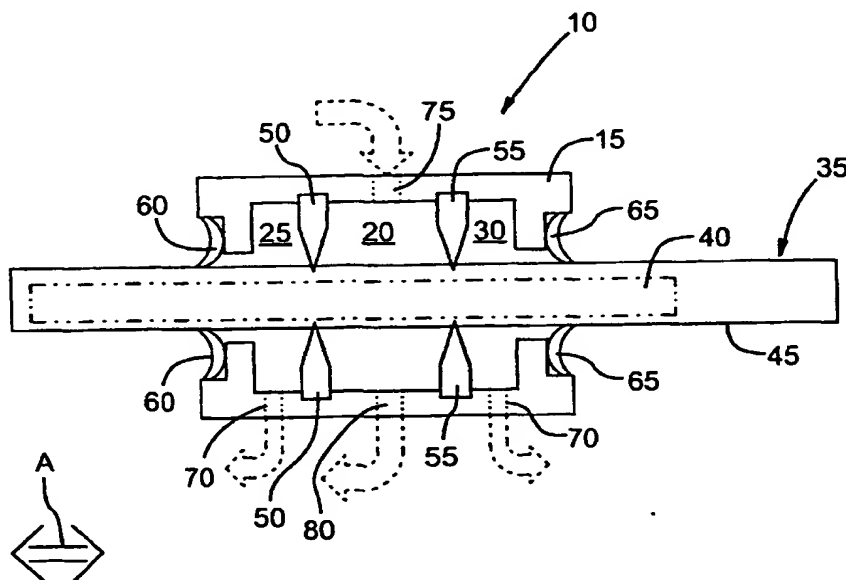
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[Continued on next page]

(54) Title: FLUID TREATMENT SYSTEM AND CLEANING APPARATUS THEREFOR



(57) Abstract: A cleaning apparatus (10) for a radiation source assembly (35) in a fluid treatment system is described. The cleaning apparatus comprises cleaning chamber (20) and a second chamber (25, 30) independent of the cleaning chamber which defines a fluid (typically water) buffer layer to obviate or mitigate cleaning fluid from the cleaning chamber leaking into the fluid being treated. The fluid treatment system is particularly useful for us in clean water applications in which ultraviolet radiation is used to treat the water while having the advantages of in situ cleaning of the radiation source when it becomes fouled.

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FLUID TREATMENT SYSTEM AND CLEANING  
APPARATUS THEREFOR

TECHNICAL FIELD

5           In one of its aspects, the present invention relates to a cleaning apparatus for use in a fluid treatment system. In another of its aspects, the present invention relates to a fluid treatment system comprising the cleaning apparatus.

BACKGROUND ART

10           Fluid treatment systems are known generally in the art.

          For example, United States patents 4,482,809, 4,872,980 and 5,006,244 (all in the name of Maarschalkerweerd and all assigned to the assignee of the present invention and hereinafter referred to as the Maarschalkerweerd #1 Patents), the contents of each of which are hereby incorporated by reference, all  
15       describe gravity fed fluid treatment systems which employ ultraviolet (UV) radiation.

          Such systems include an array of UV lamp frames which include several UV lamps each of which are mounted within sleeves which extend between and are supported by a pair of legs which are attached to a cross-piece. The so-  
20       supported sleeves (containing the UV lamps) are immersed into a fluid to be treated which is then irradiated as required. The amount of radiation to which the fluid is exposed is determined by the proximity of the fluid to the lamps, the output wattage of the lamps and the fluid's flow rate past the lamps. Typically, one or more UV sensors may be employed to monitor the UV output of the lamps  
25       and the fluid level is typically controlled, to some extent, downstream of the treatment device by means of level gates or the like.

          However, disadvantages exist with the above-described systems. Depending upon the quality of the fluid which is being treated, the sleeves surrounding the UV lamps periodically become fouled with foreign materials,  
30       inhibiting their ability to transmit UV radiation to the fluid. For a given installation, the occurrence of such fouling may be determined from historical operating data or by measurements from the UV sensors. Once fouling has

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reached a certain point, the sleeves must be cleaned to remove the fouling materials and optimize system performance.

If the UV lamp modules are employed in an open, channel-like system (e.g., such as the one described and illustrated in Maarschalkerweerd #1 Patents), one or more of the modules may be removed while the system continues to operate, and the removed frames may be immersed in a bath of suitable cleaning solution (e.g., a mild acid) which may be air-agitated to remove fouling materials. Of course, this necessitates the provision of surplus or redundant sources of UV radiation (usually by including extra UV lamp modules) to ensure adequate irradiation of the fluid being treated while one or more of the frames has been removed for cleaning. This required surplus UV capacity adds to the capital expense of installing the treatment system. Further, a cleaning vessel for receiving the UV lamp modules must also be provided and maintained. Depending on the number of modules which must be serviced for cleaning at one time and the frequency at which they require cleaning, this can also significantly add to the expense of operating and maintaining the treatment system. Furthermore, this cleaning regimen necessitates relatively high labor costs to attend to the required removal/re-installation of modules and removal/re-filling of cleaning solution in the cleaning vessel. Still further, such handling of the modules results in an increased risk of damage to or breakage of the lamps in the module.

If the frames are in a closed system (e.g., such as the treatment chamber described in United States patent 5,504,335 (in the name of Maarschalkerweerd and assigned to the assignee of the present invention), the contents of which are hereby incorporated by reference), removal of the frames from the fluid for cleaning is usually impractical. In this case, the sleeves must be cleaned by suspending treatment of the fluid, shutting inlet and outlet valves to the treatment enclosure and filling the entire treatment enclosure with the cleaning solution and air-agitating the fluid to remove the fouling materials. Cleaning such closed systems suffers from the disadvantages that the treatment system must be stopped while cleaning proceeds and that a large quantity of cleaning solution must be employed to fill the treatment enclosure. An additional problem exists in that

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handling large quantities of cleaning fluid is hazardous and disposing of large quantities of used cleaning fluid is difficult and/or expensive. Of course open flow systems suffer from these two problems, albeit to a lesser degree.

Indeed, it is the belief of the present inventors that, once installed, one of the largest maintenance costs associated with prior art fluid treatment systems is often the cost of cleaning the sleeves about the radiation sources.

United States patents 5,418,370, 5,539,210 and 5,590,390 (all in the name of Maarschalkerweerd and all assigned to the assignee of the present invention and hereinafter referred to as the Maarschalkerweerd #2 Patents), the contents of each of which are hereby incorporated by reference, all describe an improved cleaning system, particularly advantageous for use in gravity fed fluid treatment systems which employ UV radiation. Generally, the cleaning system comprises a cleaning sleeve engaging a portion of the exterior of a radiation source assembly including a radiation source (e.g., a UV lamp). The cleaning sleeve is movable between: (i) a retracted position wherein a first portion of radiation source assembly is exposed to a flow of fluid to be treated, and (ii) an extended position wherein the first portion of the radiation source assembly is completely or partially covered by the cleaning sleeve. The cleaning sleeve includes a chamber in contact with the first portion of the radiation source assembly. The chamber is supplied with a cleaning solution suitable for removing undesired materials from the first portion of the radiation source assembly.

The cleaning system described in the Maarschalkerweerd #2 Patents represents a significant advance in the art, especially when implemented in the radiation source module and fluid treatment system illustrated in these patents. More specifically, the cleaning system described in the Maarschalkerweerd #2 Patents is particularly useful in municipal wastewater treatment facilities in which the cleaning system is employed in combination with an ultraviolet radiation treatment system disposed an open channel comprising a gravity fed flow of fluid. After treatment, the fluid is then discharged into a stream, creek, river, lake or other body of water.

Clean water treatment systems present a unique set of challenges since the fluid being treated in the system is a source of potable/drinking water. If the

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cleaning system described in the Maarschalkerweerd #2 Patents were implemented in a clean water treatment system, there would be a significant likelihood of leakage of the cleaning solution from the chamber into the fluid being treated. It is desirable to avoid such leakage of cleaning solution from the  
5 cleaning system.

Thus, notwithstanding the advances in the art provided by the cleaning system taught in the Maarschalkerweerd #2 Patents, there remains a need in the art for a cleaning apparatus which may be implemented advantageously, inter alia, in a clean water treatment system.

10

#### DISCLOSURE OF THE INVENTION

It is an object of the invention to provide a cleaning apparatus which obviates or mitigates at least one of the above-mentioned disadvantages of the prior art.

15 Accordingly, in one of its aspects, the present invention provides a cleaning apparatus for use in a fluid treatment system comprising a radiation source assembly, the cleaning apparatus comprising:

at least one cleaning sleeve in sliding engagement with the exterior of the radiation source assembly;

20 a first chamber disposed in the at least one cleaning sleeve in contact with a portion of the exterior of the radiation source assembly and for being supplied with a cleaning solution;

a second chamber disposed in the at least one cleaning sleeve adjacent the first chamber;

25 seal means to restrict movement of fluid between the first chamber and the second chamber; and

drive means to translate the at least one cleaning sleeve along the exterior of the radiation source assembly.

In another of its aspects, the present invention provides a fluid treatment  
30 device comprising a housing for receiving a flow of fluid, the housing comprising:

a fluid inlet;



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a fluid outlet;  
a fluid treatment zone disposed between the fluid inlet and the fluid outlet;  
a radiation source assembly disposed in the fluid treatment zone for treatment of the flow of fluid; and

5 a cleaning apparatus comprising: at least one cleaning sleeve in sliding engagement with the exterior of the radiation source assembly; a first chamber disposed in the at least one cleaning sleeve in contact with a portion of the exterior of the radiation source assembly and for being supplied with a cleaning solution; a second chamber disposed in the at least one cleaning sleeve adjacent  
10 the first chamber; seal means to prevent substantially unrestricted movement of fluid between the first chamber and the second chamber; first drain means to withdraw fluid from the second chamber; and drive means to translate the at least one cleaning sleeve along the exterior of the radiation source assembly.

Thus, the present inventors have developed a novel cleaning device for  
15 use in a fluid treatment system. The cleaning device contains two "independent" chambers. Specifically, there is provided a cleaning chamber for containing a cleaning solution in contact with an exterior of a radiation source assembly. A second chamber is provided in the cleaning sleeve substantially adjacent the first chamber. The second chamber, in essence, functions as a fluid (typically water)  
20 buffer layer between the cleaning chamber and the fluid being treated. Thus, the fluid buffer layer acts to receive small amounts of cleaning solution which may leak from the cleaning chamber thereby obviating or mitigating passage of the cleaning fluid to the fluid being treated.

The cleaning chamber and the chamber defining the fluid buffer layer are  
25 relatively "independent" of one another. This may be achieved by using a seal between the two chambers. Since even the highest quality seals are likely to allow some leakage of cleaning fluid, the fluid buffer layer in the second chamber adjacent the cleaning chamber acts to obviate or mitigate alternate leakage of the cleaning fluid into the fluid being treated. This renders the present cleaning  
30 system advantageous for use in a clean water application where the fluid being treated is, for example, potable water.

When implemented in a fluid treatment system for clean water

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applications, it is conventional to dispose the treatment system in a closed pipe containing a pressurized (e.g., 150 psig) flow of water. If the cleaning solution in the cleaning chamber and the fluid in the second chamber acting as the fluid buffer layer are maintained at a pressure lower than the pressure of the fluid flow through the fluid treatment system, there is, in essence, a pressure drop across the region of the fluid flow and the two chambers of the cleaning device. This pressure drop assists in obviating or mitigating leakage of fluid from the cleaning chamber through the second chamber to the fluid being treated.

In a preferred embodiment, the second chamber defining the fluid buffer layer further includes a drain to remove fluid from the second chamber. This further obviates or mitigates leakage of cleaning solution from the cleaning chamber through the second chamber to the fluid being treated.

In a further preferred embodiment, the cleaning chamber is provided with a supply and drain to add and remove cleaning solution to and from the cleaning chamber. In a further preferred embodiment, this supply and drain in the cleaning chamber is comprised in a recirculation system which allows for addition of cleaning solution, as required.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will be described with reference to the accompanying drawings, in which:

Figure 1 illustrates a schematic, in cross-section, of a preferred embodiment of the present cleaning device;

Figure 2 and 3 illustrate side elevations, in cross-section, of a preferred embodiment of a fluid treatment device comprising a preferred embodiment of the present cleaning apparatus;

Figures 4 and 5 illustrate enlarged side elevations, cross-section of the cleaning apparatus illustrated in Figures 2 and 3, respectively; and

Figure 6-8 illustrate photographs of a particularly preferred embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

With reference to Figure 1, there is illustrated a cleaning apparatus 10. Cleaning apparatus 10 comprises a cleaning sleeve 15. Cleaning sleeve 15 comprises a cleaning chamber 20 and a pair of second chambers 25,30. Cleaning sleeve 15 is disposed over a radiation source assembly 35 comprising a radiation source 40 enclosed within a protective sleeve 45.

Cleaning chamber 20 is separated from second chambers 25,30 by a pair of seals 50,55.

Second chambers 25,30 are sealed from the exterior of the cleaning sleeve 15 by a pair of annular seals 60,65. Cleaning sleeve 15 is reversibly movable along the exterior of protective sleeve 45 in the direction of arrow A. The actuation of cleaning sleeve 15 along the exterior of protective sleeve 45 will be described in more detail hereinbelow.

Cleaning sleeve 15 further comprises a drain 70 from each of second chambers 25,30. Drain 70 may be utilized at atmospheric pressure. Of course, the illustrated embodiment could be modified to have a single drain from one of second chambers 25,30, and by providing communication between second chambers 25,30. Further, a cleaning solution supply inlet 75 is provided in cleaning sleeve 15 and serves to allow for supply of cleaning solution to cleaning chamber 20. Also, a cleaning supply outlet 80 is provided to allow for withdrawal of cleaning solution from cleaning chamber 20.

With reference to Figures 2 and 3, there is illustrated a fluid treatment device 100 comprising an inlet 105, an outlet 110 and a housing 115. A pair of opposed flanges 120,125 are disposed at opposite ends of housing 115. A pair of opposed cover plates 130,135 are attached to flanges 120,125, respectively, to provide, in the case of treating liquids, a fluid-tight seal.

Disposed in housing 115 is a radiation source assembly 140 comprising a pair of radiation, preferably ultraviolet radiation, lamps 145 disposed within a protective sleeve 150 - e.g., a quartz sleeve.

Disposed adjacent cover plate 135 is a cleaning apparatus 200. Cleaning apparatus 200 comprises a pair of rods 205,210 which are slidably moveable through cover plate 135. Attached to the ends of rods 205,210 is a cleaning

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sleeve 300, the details of which will be described below. Attached to the other ends of rods 205,210 is a plate 215 which is connected to a slide 219 movable along a rail 220. Rail 220 is a conventional electric screw drive which is connected to an electric motor (not shown) or other electric motive means. The electric motor serves to rotate the screw (not shown) which translates slide 219 along rail 220 thereby moving plate 215.

With reference to Figures 4 and 5, a more detailed explanation of the design of cleaning sleeve 300 will be provided. Thus, cleaning sleeve 300 comprises a sleeve element 305 which surrounds and is movable over protective sleeve 150 of radiation source assembly 140 (see Figures 2 and 3). Sleeve element 305 includes a chamber 310 for receiving a cleaning fluid - in Figure 5, the cleaning fluid is shown in solid black. Cleaning chamber 310 is coupled to an elbow connector 315 which in turn is coupled to rod 205 and, ultimately, plate 215. A line 320 is connected to plate 215 and in turn to rod 205 via an elbow connector 325. The other end of line 320 is connected to a supply of cleaning fluid (not shown). The cleaning fluid may be acetic acid or any other suitable fluid which will facilitate removal of fouling materials (e.g., minerals, algae and the like) from the surface of protective sleeve 150. In essence, cleaning chamber 310 is defined by a pair of seals 330,335 which, when sleeve 300 is mounted on quartz sleeve 150, form a substantially fluid-tight type seal. Seals 330,335 are annular seals which surround quartz sleeve 150. Substantially adjacent seals 330,335 are a pair of Teflon™ bearings 340,345, respectively.

Adjacent Teflon™ bearing 340,345 are a pair of second seals 350,355, respectively.

With reference to Figure 4, in essence, Teflon™ bearings 340,345 are disposed in a chamber 360 defined between seals 330,335 and 350,355, respectively. This can be seen clearly in Figure 4 which illustrates a flow of fluid in black from second chamber 360.

Opposite elbow connection 315 attached to sleeve element 305 is another elbow element 365 which is connected to rod 210 and in turn to plate 215.

As will be apparent, rod 210 includes a coaxial line which serves two purposes. First, with reference to Figure 5, cleaning fluid (shown in black) may

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be removed from cleaning chamber 310 via an internal line 370 in rod 210. The disposition of line 370 in this manner creates a second line 375 coaxially disposed around line 370. The function of line 375 is illustrated in Figure 4 and served to remove fluid from second chamber 360. Thus, rod 210 serves to both remove  
5 cleaning solution from chamber 310 and independently remove fluid from second chamber 360.

Preferably lines 320 and 370 are connected to a recirculation pump which allows for cleaning solution to be recirculated through cleaning sleeve 300 as illustrated in Figure 5 (the cleaning solution is shown in black. Recirculation can  
10 be continuous or on a periodic basis. It should be apparent that the cleaning solution may be circulated in the reverse direction to that described above.

In operation, when it is desired to clean the exterior of protective sleeve 150, the electrically driven screw (not shown) in rail 220 is actuated thereby moving plate 215 with respect to rail 220. This results in movement of cleaning  
15 sleeve 300 over protective sleeve 150. Such cleaning can be done while fluid treatment device 100 is in operation or while it has been shut down for maintenance or another reason. Further, it is possible to design the dimensions of housing 115 such that cleaning sleeve 300 may be parked in a position in housing 115 such that it does not interfere with the hydraulic flow of fluid  
20 through the device. As will be apparent to those of skill in the art. Figure 2 shows cleaning sleeve in the fully extended (i.e., into housing 115) position whereas Figure 3 illustrates cleaning sleeve in a retracted position.

While the present invention has been described with reference to preferred and specifically illustrated embodiments, it will of course be understood by those  
25 of skill in the arts that various modifications to these preferred and illustrated embodiments may be made without the parting from the spirit and scope of the invention.

All publications, patents and patent applications referred to herein are incorporated by reference in their entirety to the same extent as if each individual  
30 publication, patent or patent application was specifically and individually indicated to be incorporated by reference in its entirety.

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What is claimed is:

1. A cleaning apparatus for use in a fluid treatment system comprising a radiation source assembly, the cleaning apparatus comprising:
  - at least one cleaning sleeve in sliding engagement with the exterior of the radiation source assembly;
  - a first chamber disposed in the at least one cleaning sleeve in contact with a portion of the exterior of the radiation source assembly and for being supplied with a cleaning solution;
  - a second chamber disposed in the at least one cleaning sleeve adjacent the first chamber;
  - seal means to restrict movement of fluid between the first chamber and the second chamber; and
  - drive means to translate the at least one cleaning sleeve along the exterior of the radiation source assembly.
2. The cleaning apparatus defined in claim 1, further comprising first drain means to withdraw fluid from the second chamber.
3. The cleaning apparatus defined in claims 1-2, further comprising second drain means to withdraw cleaning fluid from the first chamber.
4. The cleaning apparatus defined in claims 1-3, further comprising supply means to supply cleaning fluid to the first chamber.
5. The cleaning apparatus defined in claims 1-4, wherein the first chamber comprises a first annular chamber substantially surrounding the exterior of the radiation source assembly.
6. The cleaning apparatus defined in claims 1-5, wherein the second chamber comprises a pair of second annular chambers on opposed sides of the first chamber and substantially surrounding the exterior of the radiation source

assembly.

7. The cleaning apparatus defined in claims 1-6, wherein the pair of second annular chambers are in communication with one another.
8. The cleaning apparatus defined in claims 1-7, wherein the seal means defines a barrier between the first chamber and the second chamber.
9. The cleaning apparatus defined in claims 1-8, further comprising second seal means disposed between the at least one cleaning sleeve and the exterior of the radiation source assembly.
10. The cleaning apparatus defined in claims 1-9, wherein the radiation source assembly comprises at least one radiation source disposed in a protective sleeve.
11. The cleaning apparatus defined in claims 1-10, wherein the protective sleeve comprises a quartz sleeve.
12. A fluid treatment device comprising a housing for receiving a flow of fluid, the housing comprising:
  - a fluid inlet;
  - a fluid outlet;
  - a fluid treatment zone disposed between the fluid inlet and the fluid outlet;
  - a radiation source assembly disposed in the fluid treatment zone for treatment of the flow of fluid; and
  - a cleaning apparatus comprising: at least one cleaning sleeve in sliding engagement with the exterior of the radiation source assembly; a first chamber disposed in the at least one cleaning sleeve in contact with a portion of the exterior of the radiation source assembly and for being supplied with a cleaning solution; a second chamber disposed in the at least one cleaning sleeve adjacent the first chamber; seal means to prevent substantially unrestricted movement of fluid between the first chamber and the second chamber; first drain means to

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withdraw fluid from the second chamber; and drive means to translate the at least one cleaning sleeve along the exterior of the radiation source assembly.

13. The fluid treatment device defined in claim 12, wherein the cleaning apparatus further comprises first drain means to withdraw fluid from the second chamber.

14. The fluid treatment device defined in claims 12-13, wherein the cleaning apparatus further comprises second drain means to withdraw cleaning fluid from the first chamber.

15. The fluid treatment device defined in claims 12-14, wherein the cleaning apparatus further comprises supply means to supply cleaning fluid to the first chamber.

16. The fluid treatment device defined in claims 12-15, wherein the first chamber comprises a first annular chamber substantially surrounding the exterior of the radiation source assembly.

17. The fluid treatment device defined in claims 12-16, wherein the second chamber comprises a pair of second annular chambers on opposed sides of the first chamber and substantially surround the exterior of the radiation source assembly.

18. The fluid treatment device defined in claims 12-17, wherein the pair of second annular chambers are in communication with one another.

19. The fluid treatment device defined in claims 12-18, wherein the seal means defines a barrier between the first chamber and the second chamber.

20. The fluid treatment device defined in claims 12-19, wherein the cleaning



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apparatus further comprises second seal means disposed between the at least one cleaning sleeve and the exterior of the radiation source assembly.

21. The fluid treatment device defined in claims 12-20, wherein the protective sleeve comprises a quartz sleeve.

22. The fluid treatment device defined in claims 12-21, wherein the fluid treatment zone comprises a substantially elongate irradiation zone.

23. The fluid treatment device defined in claims 12-22, wherein the radiation source assembly comprises at least one radiation source disposed in a protective sleeve.

24. The fluid treatment device defined in claims 12-23, wherein the at least one radiation source is substantially elongate.

25. The fluid treatment device defined in claims 12-24, wherein the at least one radiation source is disposed substantially parallel to a flow of fluid through the irradiation zone.

26. The fluid treatment device defined in claims 12-25, wherein the at least one radiation source is disposed substantially transverse to a flow of fluid through the irradiation zone.

27. The fluid treatment device defined in claims 12-26, wherein the fluid inlet, the fluid outlet and the fluid treatment zone are arranged in a substantially collinear manner.

28. The fluid treatment device defined in claims 12-27, wherein the fluid inlet, the fluid outlet and the fluid treatment zone have substantially the same cross-section.

-14-

29. The fluid treatment device defined in claims 12-28, wherein the fluid inlet, the fluid outlet and the fluid treatment zone are arranged in a substantially non-collinear manner.

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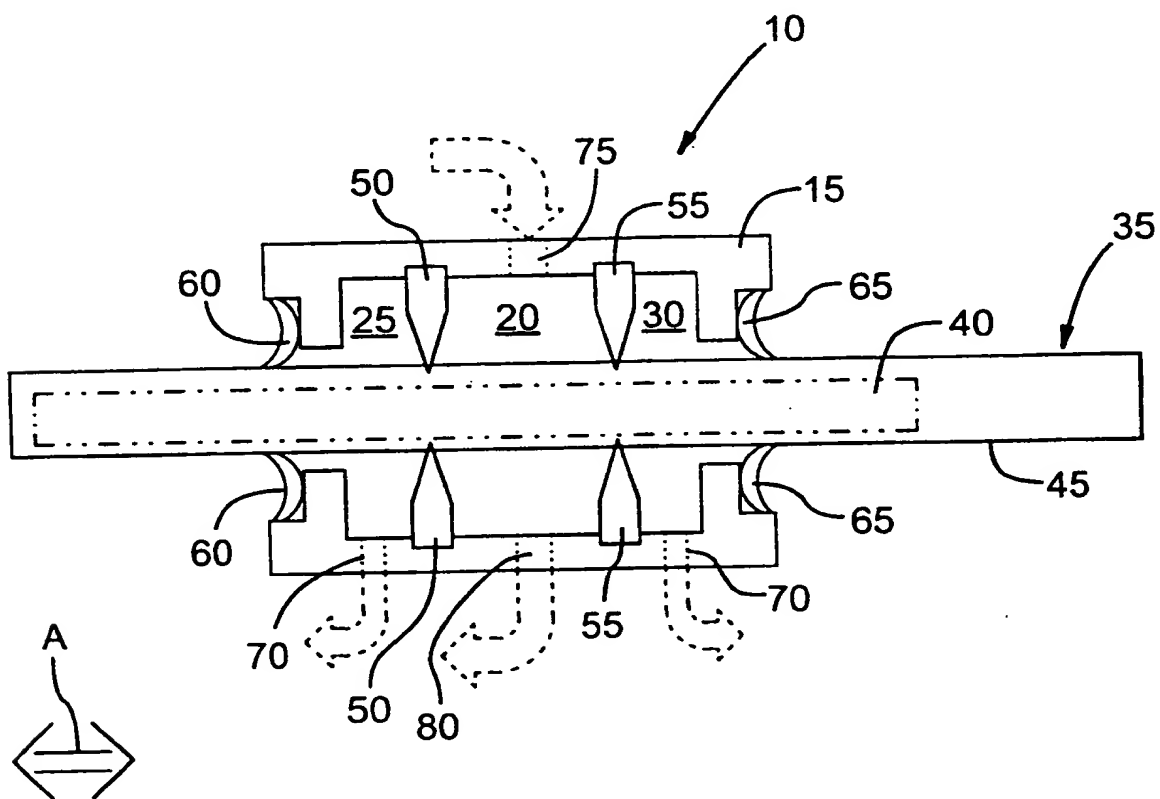


FIG. 1

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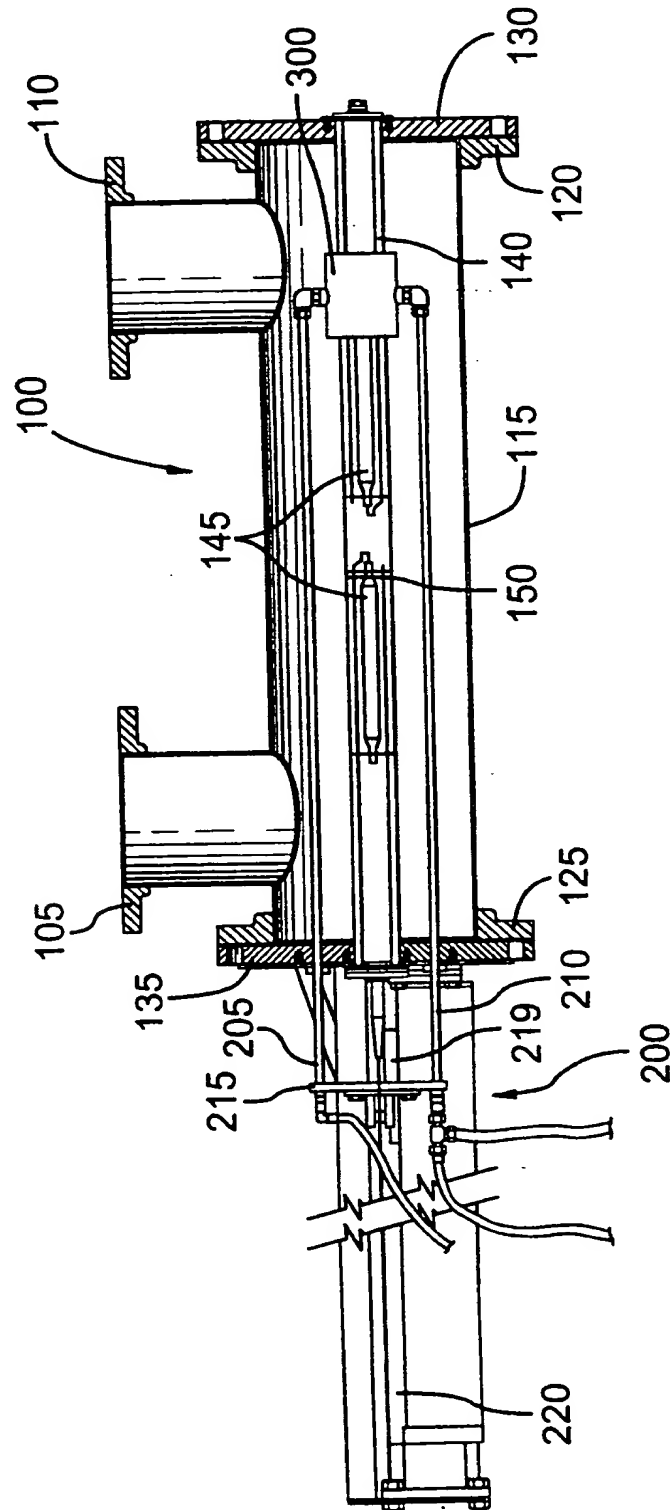


FIG.2

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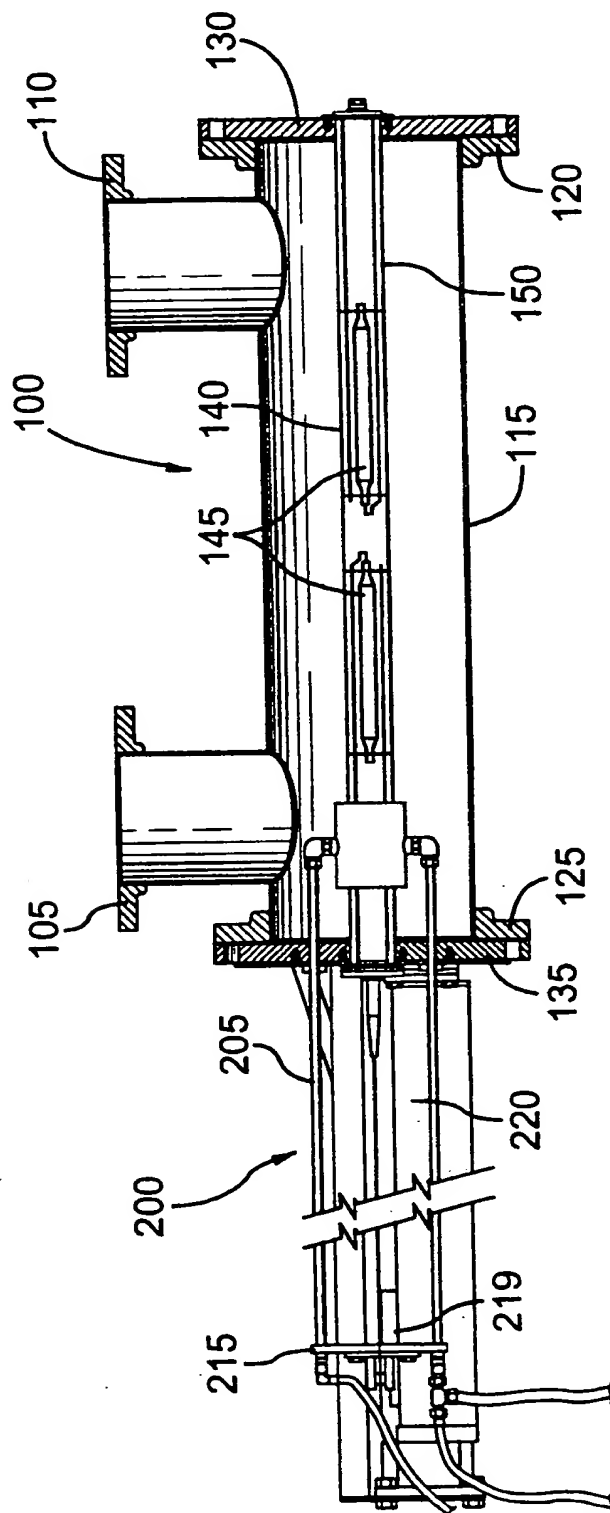


FIG.3

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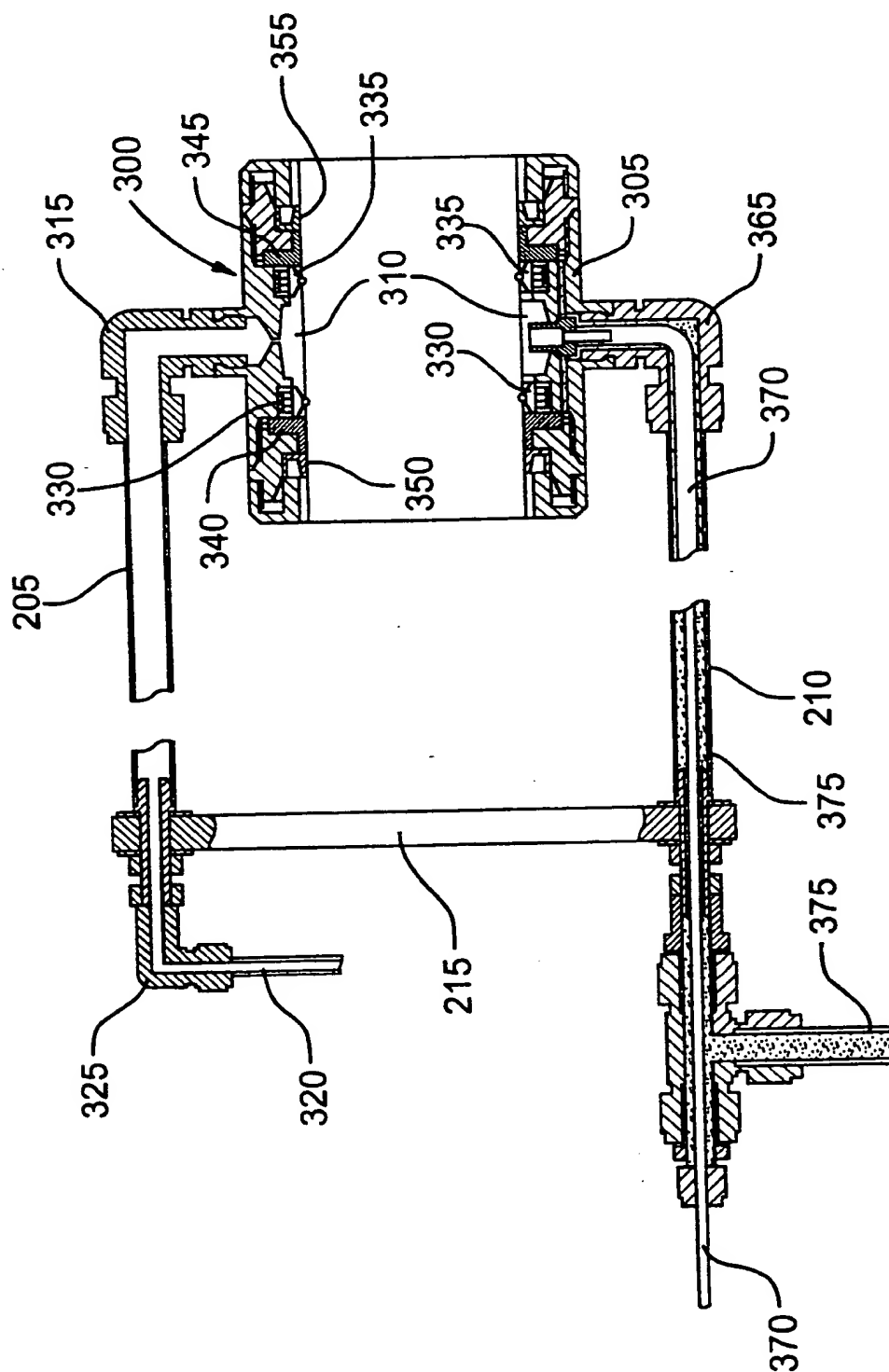
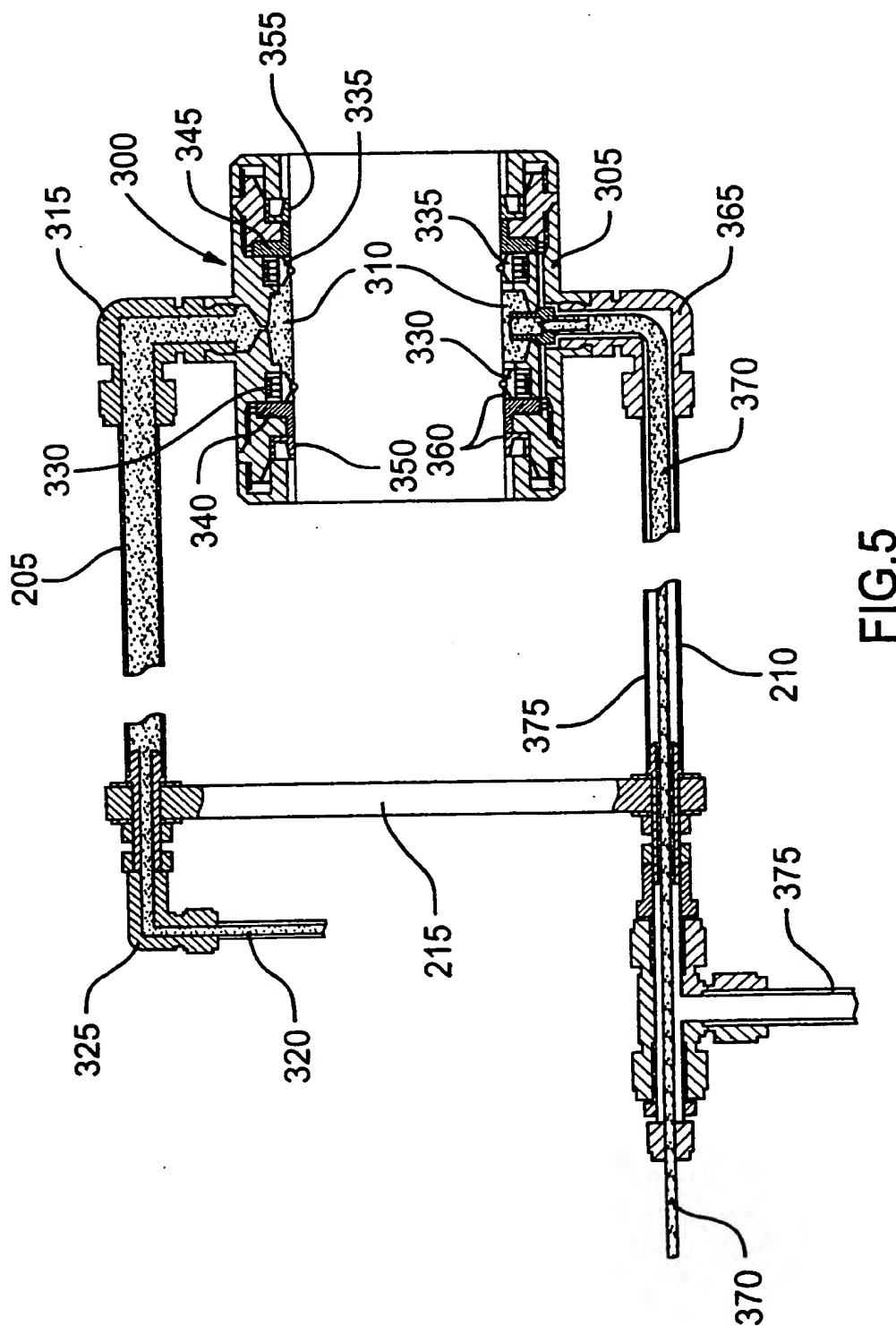


FIG. 4

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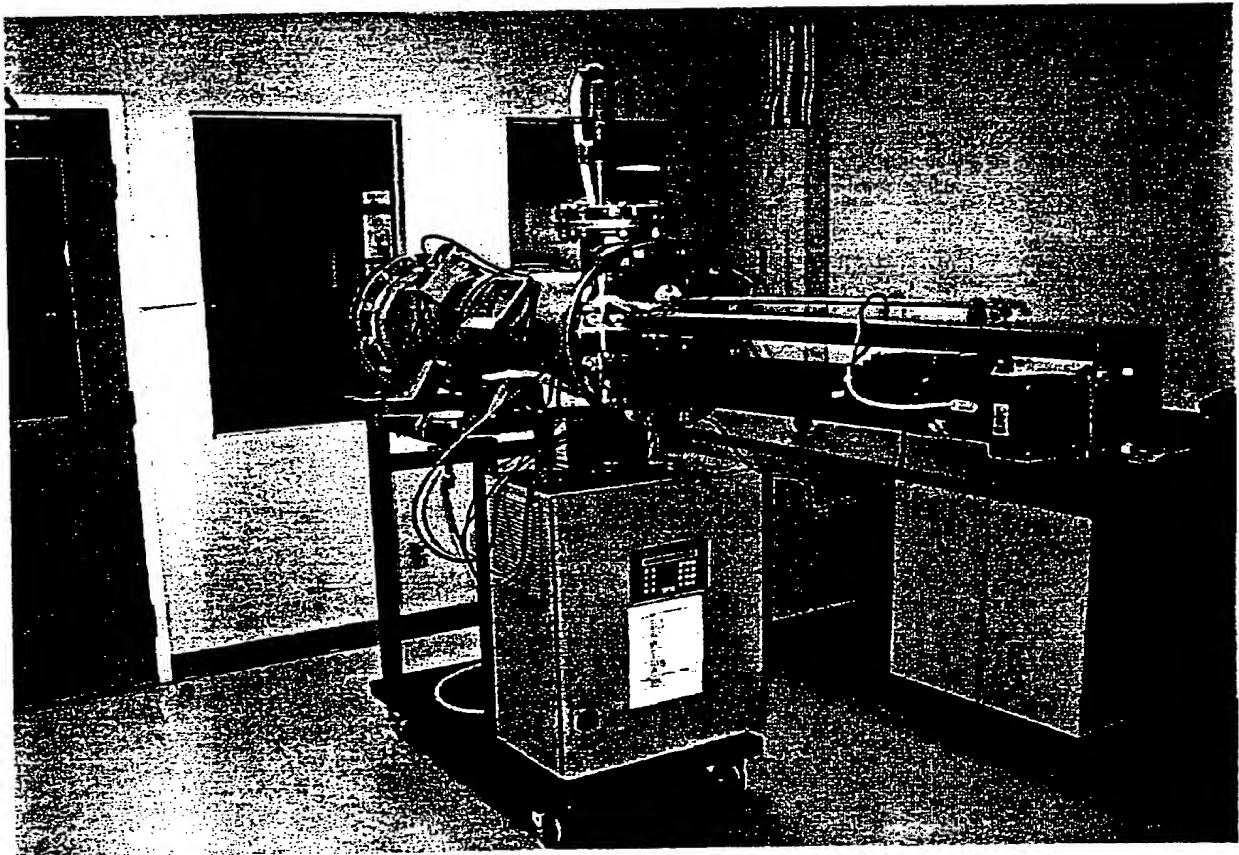


FIG. 6



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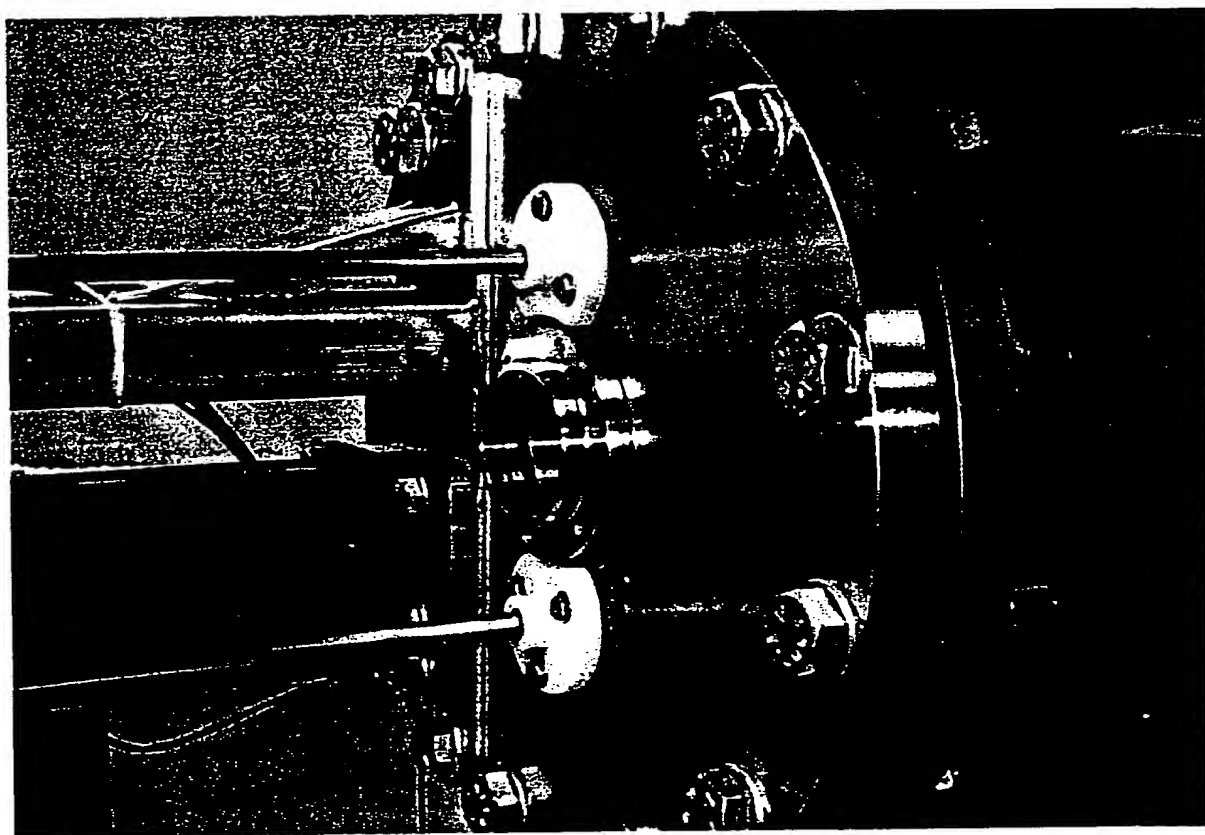


FIG. 7

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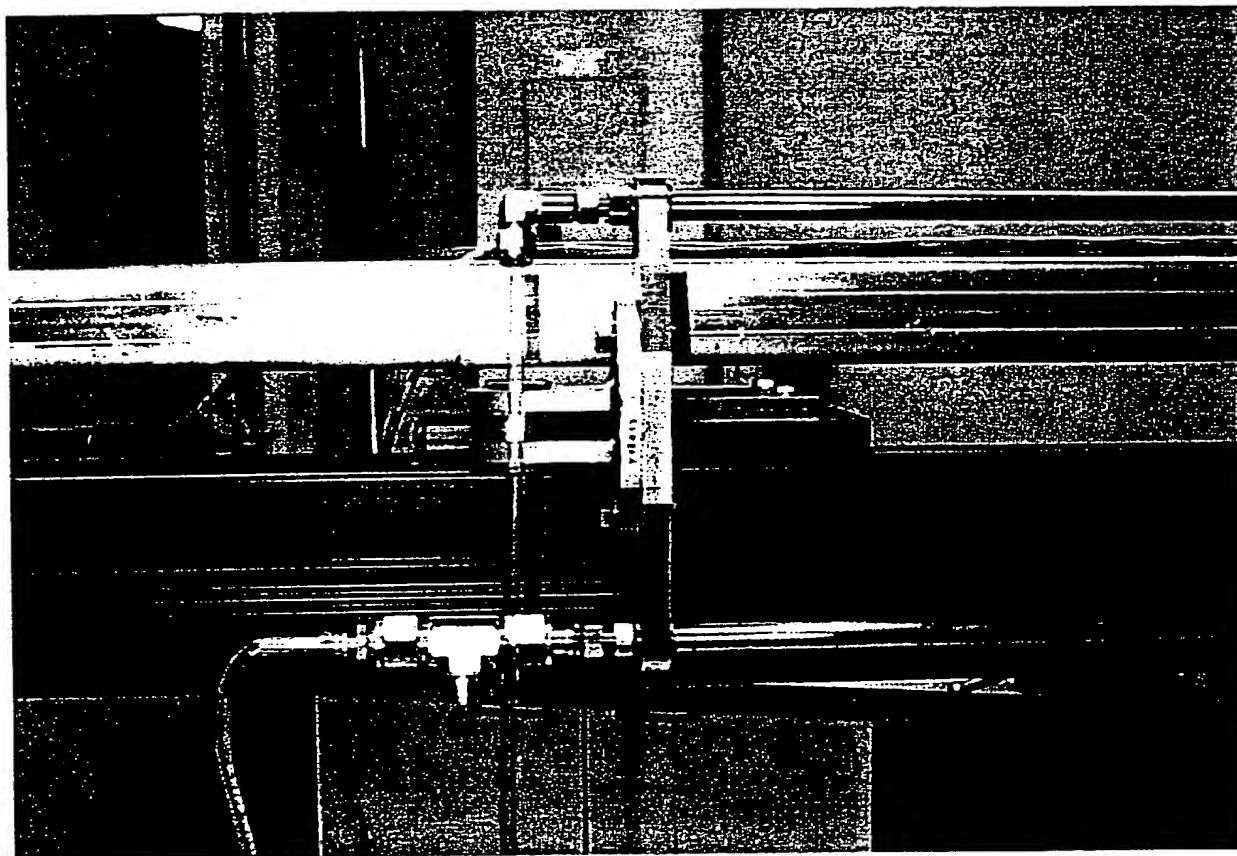


FIG. 8

# PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

## PCT

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OR THE DECLARATION  
(PCT Rule 44.1)  
GOWLING STRATHY & HENDERSON LLP  
PATENT DEPARTMENT

Date of mailing  
(day/month/year)

02/08/2000

Applicant's or agent's file reference

T8465066W0

**FOR FURTHER ACTION**

See paragraphs 1 and 4 below

International application No.

PCT/CA 00/ 00617

International filing date

(day/month/year)

26/05/2000

Applicant

TROJAN TECHNOLOGIES INC. et al.

1. ☒ The applicant is hereby notified that the International Search Report has been established and is transmitted herewith.

**Filing of amendments and statement under Article 19:**

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

**When?** The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

**Where?** Directly to the International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland  
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no International Search Report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected in the demand or in a later election within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2  
NL-2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.  
Fax: (+31-70) 340-3016

Authorized officer

Véronique Baillou

## NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the PCT Applicant's Guide, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions respectively.

### INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

#### What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

#### When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

#### Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

#### How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

#### What documents must/may accompany the amendments?

##### Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

## NOTES TO FORM PCT/ISA/220 (continued)

The letter must indicate the differences between the claims as filed and the claims as amended. It must, in particular, indicate, in connection with each claim appearing in the international application (it being understood that identical indications concerning several claims may be grouped), whether

- (i) the claim is unchanged;
- (ii) the claim is cancelled;
- (iii) the claim is new;
- (iv) the claim replaces one or more claims as filed;
- (v) the claim is the result of the division of a claim as filed.

The following examples illustrate the manner in which amendments must be explained in the accompanying letter:

1. [Where originally there were 48 claims and after amendment of some claims there are 51]:  
"Claims 1 to 29, 31, 32, 34, 35, 37 to 48 replaced by amended claims bearing the same numbers; claims 30, 33 and 36 unchanged; new claims 49 to 51 added."
2. [Where originally there were 15 claims and after amendment of all claims there are 11]:  
"Claims 1 to 15 replaced by amended claims 1 to 11."
3. [Where originally there were 14 claims and the amendments consist in cancelling some claims and in adding new claims]:  
"Claims 1 to 6 and 14 unchanged; claims 7 to 13 cancelled; new claims 15, 16 and 17 added." or  
"Claims 7 to 13 cancelled; new claims 15, 16 and 17 added; all other claims unchanged."
4. [Where various kinds of amendments are made]:  
"Claims 1-10 unchanged; claims 11 to 13, 18 and 19 cancelled; claims 14, 15 and 16 replaced by amended claim 14; claim 17 subdivided into amended claims 15, 16 and 17; new claims 20 and 21 added."

### "Statement under article 19(1)" (Rule 46.4)

The amendments may be accompanied by a statement explaining the amendments and indicating any impact that such amendments might have on the description and the drawings (which cannot be amended under Article 19(1)).

The statement will be published with the international application and the amended claims.

**It must be in the language in which the international application is to be published.**

It must be brief, not exceeding 500 words if in English or if translated into English.

It should not be confused with and does not replace the letter indicating the differences between the claims as filed and as amended. It must be filed on a separate sheet and must be identified as such by a heading, preferably by using the words "Statement under Article 19(1)."

It may not contain any disparaging comments on the international search report or the relevance of citations contained in that report. Reference to citations, relevant to a given claim, contained in the international search report may be made only in connection with an amendment of that claim.

### Consequence if a demand for international preliminary examination has already been filed

If, at the time of filing any amendments under Article 19, a demand for international preliminary examination has already been submitted, the applicant must preferably, at the same time of filing the amendments with the International Bureau, also file a copy of such amendments with the International Preliminary Examining Authority (see Rule 62.2(a), first sentence).

### Consequence with regard to translation of the international application for entry into the national phase

The applicant's attention is drawn to the fact that, where upon entry into the national phase, a translation of the claims as amended under Article 19 may have to be furnished to the designated/elected Offices, instead of, or in addition to, the translation of the claims as filed.

For further details on the requirements of each designated/elected Office, see Volume II of the PCT Applicant's Guide.

# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>T8465066WO</b>	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> <b>FOR FURTHER ACTION</b> </div> <div style="font-size: small;">             see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.           </div> </div>	
International application No. <b>PCT/CA 00/ 00617</b>	International filing date (day/month/year) <div style="text-align: center;"><b>26/05/2000</b></div>	(Earliest) Priority Date (day/month/year) <div style="text-align: center;"><b>28/05/1999</b></div>
Applicant  <b>TROJAN TECHNOLOGIES INC. et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of Invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1  
☐ None of the figures.

# INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 00/00617

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C02F1/32

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C02F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 590 390 A (MAARSCHALKERWEERD JAN M) 31 December 1996 (1996-12-31)  column 5, line 15 - line 35 column 6, line 39 -column 7, line 29 figures 3-5 ---	1-5, 8-10, 12-16, 19,20, 22-25,27
A	US 5 874 740 A (ISHIYAMA EIICHI) 23 February 1999 (1999-02-23) column 3, line 9 -column 4, line 20 figures ---	1-9
A	EP 0 743 105 A (BERSON MILIEUTECH) 20 November 1996 (1996-11-20) column 3, line 9 -column 5, line 6 figures 2,3,5 -----	1-29

☐

Further documents are listed in the continuation of box C.

☒

Patent family members are listed in annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"8" document member of the same patent family

Date of the actual completion of the international search

19 July 2000

Date of mailing of the international search report

02/08/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl.  
Fax: (+31-70) 340-3016

Authorized officer

Miebach, V

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA 00/ 00617

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A cleaning apparatus (10) for a radiation source assembly (35) in a fluid treatment system is described. The cleaning apparatus comprises cleaning chamber (20) and a second chamber (25,30) independent of the cleaning chamber which defines a fluid (typically water) buffer layer to obviate or mitigate cleaning fluid from the cleaning chamber leaking into the fluid being treated. The fluid treatment system is particularly useful for use in clean water applications in which ultraviolet radiation is used to treat the water while having the advantages of in situ cleaning of the radiation source when it becomes fouled.



# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 00/00617

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5590390	A	31-12-1996	US 5418370 A	23-05-1995
			AU 6153194 A	26-09-1994
			BR 9406347 A	13-02-1996
			DE 69408441 D	12-03-1998
			DE 69408441 T	17-09-1998
			EP 0687201 A	20-12-1995
			EP 0811579 A	10-12-1997
			FI 954134 A	04-09-1995
			JP 8509905 T	22-10-1996
			NO 953451 A	01-09-1995
			NZ 262088 A	19-12-1997
			PL 310528 A	27-12-1995
			PL 177739 B	31-01-2000
			PL 177744 B	31-01-2000
			RO 114754 A	30-07-1999
			SK 109195 A	03-04-1996
			AT 162956 T	15-02-1998
			AU 9610098 A	22-07-1999
			CA 2117040 A,C	06-09-1994
			CA 2239925 A	06-09-1994
			WO 9420208 A	15-09-1994
			CN 1121320 A	24-04-1996
			CZ 9502264 A	17-04-1996
			ES 2115937 T	01-07-1998
			HU 76196 A,B	28-07-1997
			IL 108709 A	04-01-1998
			IL 121308 A	20-06-1999
			IL 121309 A	09-05-1999
			NZ 328583 A	28-01-1999
			US 5539210 A	23-07-1996
			ZA 9401096 A	16-09-1994
US 5874740	A	23-02-1999	JP 9299938 A	25-11-1997
EP 0743105	A	20-11-1996	NL 1000386 C	19-11-1996